

# TECHNICAL NOTES

U. S. DEPARTMENT OF AGRICULTURE

NEVADA

SOIL CONSERVATION SERVICE

TN - BIOLOGY - NV-7

May, 1972

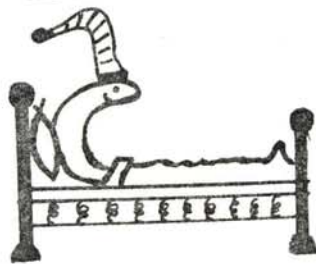
The following material was developed by the Soil Conservation Service in New Mexico. It suggests that a PERLITE-paper mixture is superior to the conventional types of bedding material.

Additional copies of this Note are available from the State Office.

Norman R. Ritter  
State Resource Conservationist

## EARTHWORM CULTURE

Commercial earthworm growers in New Mexico have experienced production problems. The inability to standardize temperatures, bedding material and feeding practices has caused die-offs and uneven production. The Soil Conservation Service, in cooperation with interested commercial growers, has field tested a new production system which appears to be more satisfactory than commonly used methods.



## BEDDING

A bedding material prepared with equal parts of fine mesh PERLITE and ground newspaper has proven to be very satisfactory. Under production conditions the bedding remained friable, maintained a desirable moisture content and did not tend to become soured. The ratio of perlite to newspaper may be adjusted to meet local conditions. Perlite is a form of volcanic rock which is mined and processed primarily for use as a light weight aggregate in construction materials, insulation and greenhouse bedding.

To prepare the bedding material, remove and discard the color sections of newspapers, grind the paper in a hammermill using  $\frac{1}{4}$ " or  $\frac{1}{2}$ " screens. Mix in the perlite and wet the mixture to the point when two or three drops of water can be squeezed from a handful. This degree of "barely wet" should be maintained in the beds during production.

Oats may be sown on the beds, grown to 6" height, then turned under. Experience indicates that the oat sprouts may remove animal wastes and help to keep the bedding in superior condition.

Following a production cycle, the used bedding material is normally discarded. Beds are cleaned and disinfected and new bedding material is installed before restocking.



## STOCKING

Earthworms are sold under many trade names and are available from many suppliers. The characteristics of a number of types of worms have been evaluated:

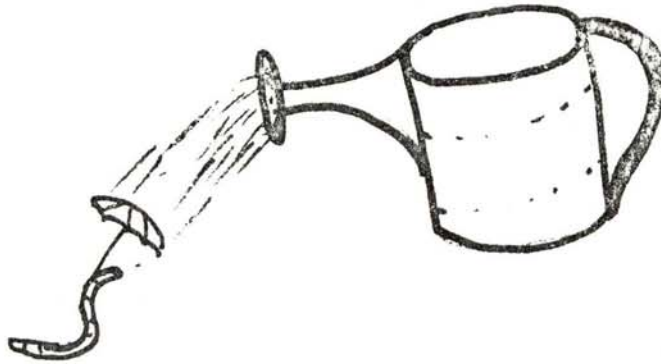
1. Athens Gray Crawlers are extremely hardy but breed slowly.
2. Canadian Crawlers cannot tolerate bedding temperatures above 70 degrees.
3. African Night Crawlers cannot tolerate bedding temperatures below 50 degrees, and will require heated beds; but they are one of the best breeders available.
4. Red Wigglers have wide adaptation to growing conditions but produce a smaller worm than the crawler varieties.

Most commercial producers will benefit from growing both the wriggle and the crawler types in order to satisfy market demands.

All types of worms are stocked at the rate of 100 to 200 worms per square foot of bed averaging 8 to 10 inches in depth. These stocking rates will result in 3000 to 6000 breeders in a conventional 10'x3'x8" production bed.

Normal production cycles average 90 days. Salable worms are then harvested, the beds are cleaned and new bedding materials installed, and breeders are restocked. The duration of a production cycle will vary with the type of worm used, temperature of the bedding material and feeding program.





## WATERING

Some of the more serious production problems result from poor watering practices. The perlite-paper bedding material will maintain a desirable moisture content from the top of the bed to the bottom if watering is done properly. Over-watering will cause a pool of water to form in the bottom of the bed, which leads to fouling of the bedding material. When the bedding is allowed to dry out the worms move to deeper layers and cannot utilize the feed which is placed on the surface.

Worm beds should be sprinkled and not flooded. The bedding material should be kept fairly damp, but not saturated. Test the bedding material frequently to determine when watering is needed. Do not provide drainage openings in the bottom of the beds.

Maintaining a high humidity and a relatively constant air temperature in the building will help to stabilize watering practices. When beds are artificially heated it will be necessary to increase the frequency of watering.

The water used should be within a 10° F. temperature range of the bedding temperature. Cold water will shock the worms and production will decline.

Maintaining a pH of 7.0 to 8.0 in the bedding moisture appears to benefit production. Normal aging of the beds occurs during the production cycle as waste products and unconsumed feed accumulates. This aging process results in a lowered pH. Satisfactory production techniques for buffering to the desired pH range have not been developed.

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## FEEDING

Information available to guide growers in the selection of recommended worm feeds has been sketchy and contradictory. Consequently, production rates and feeding schedules have been highly variable. Poor selection of feeds and poor feeding practices usually lead to disease and low quality production

Some general guidelines for selecting a satisfactory production worm feed are:

1. Protein content should be less than 14 percent.
2. The protein should be from non-animal sources.
3. The protein should be supplied by a combination of plant sources.
4. The feed must be free of salt.
5. The feed must not contain herbicide or insecticide contamination.

Very satisfactory growth and reproduction, with no loss of bedding quality, was experienced during controlled feeding with commercial cow-calf supplements. This type of livestock feed is available under a number of trade names from most feed companies. Purina salt free "Grass Stretcher"\* was utilized in feeding trials. These general types of livestock supplement feeds contain vitamins, minerals, multiple plant protein sources and contain no animal sources of protein.

Finely ground whole corn has also proven to be a satisfactory production food. Insure that the corn has not been treated with pesticides.

Worms are fed by first wetting the surface of the bedding material, then spreading a 6 to 8 inch wide band of feed along the surface of the bed. A satisfactory production feeding rate is one ounce of feed for each square foot of bed.

The frequency of feeding will vary with bedding temperature and the density of worms in the bed. In most cases the food will be consumed in 2 to 3 days, at which time more food is distributed.

Overfeeding is not only wasteful but causes fermentation and degradation of the bedding. Toxic conditions in the bedding may be produced as a result of overfeeding or using unsuitable foods.

\*The use of a trade name does not constitute an endorsement of product lines by the Soil Conservation Service, but is intended only as being descriptive of a general type of product.

## GENERAL MANAGEMENT CONSIDERATIONS

1. Peat and sphagnum moss have been traditionally used for bedding, as have various types of rotted manures. None of these bedding materials have proven to be as satisfactory as the perlite-paper mixture during production trials.
2. The perlite-paper mixture does not require frequent turning or mixing, as long as good management techniques are followed.
3. Rations containing high protein levels or with animal protein sources have caused rapid fouling of beds, together with disease, die off and low production of worms.
4. Production beds may be constructed of lumber. A standard design for a typical worm bed is attached. Coat the insides of the bed with parafin. Be sure to construct an overhanging rimboard to prevent the worms from crawling out. Do not use metal containers for worm production.
5. Check frequently for ants and centipedes. If worm eating insects or small mammals are a problem, place the legs of the beds in pails containing kerosene.
6. Purchase good quality, healthy breeders from a reputable dealer. Bargains are cheaper but the worms are usually small, underfed, or may be of a non-productive hybrid line. Such worms may be alright for fishing but not for breeding.
7. Grow more than one kind of worm; but keep them separated in different beds. Diversity is an asset.
8. Buildings used for worm production should be kept darkened. Maintain a high humidity and a relatively constant air temperature.

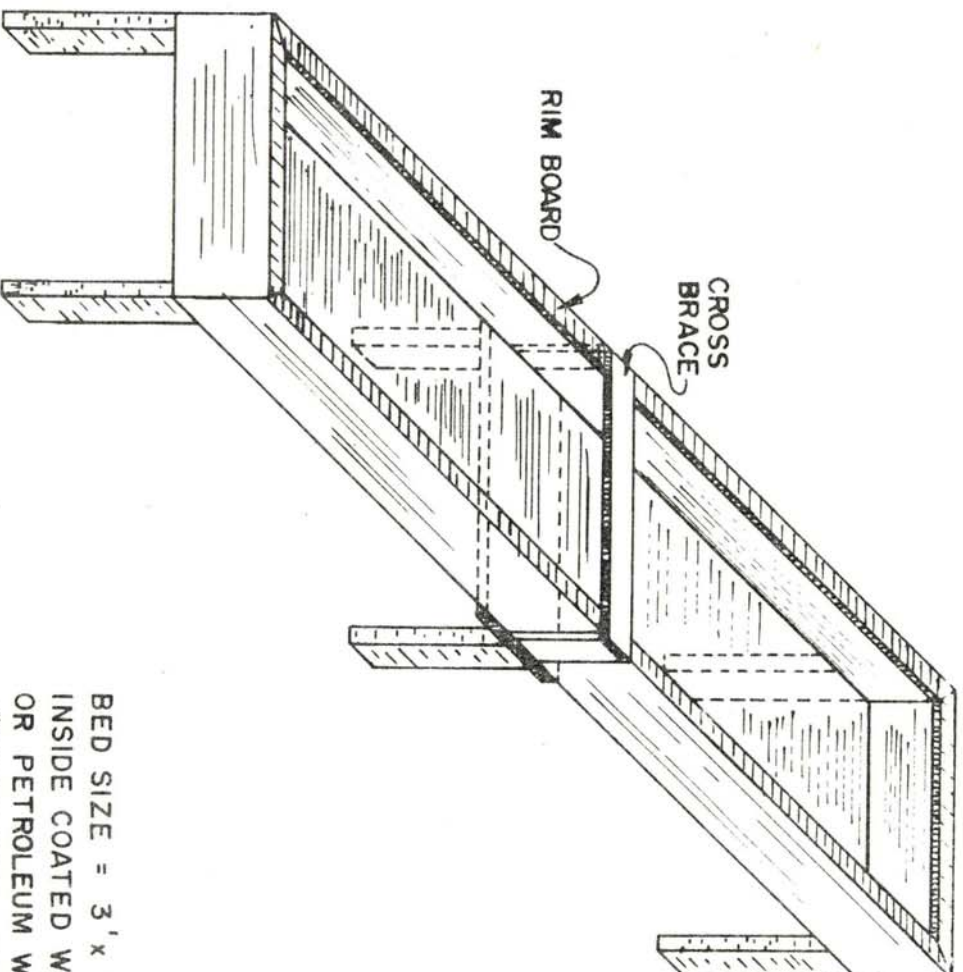
The building should be sealed against insects and small animals.

## ADDITIONAL REFERENCE SOURCES

Shields Publications, P. O. Box 472, Elgin, Illinois 60120  
publishes a general line of "How-to-do-it" booklets.

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## TYPICAL COMMERCIAL WORM BED



BED SIZE = 3' x 10'  
INSIDE COATED WITH HOT PARAFIN  
OR PETROLEUM WAX.  
2" RIM BOARD - KEEPS WORMS FROM  
CRAWLING OUT OF BEDS.  
SIDES AND BOTTOM - 1" x 12" BOARDS  
LEGS = 2" x 4" OR LARGER  
BEDS MAY BE STACKED 2 OR 3 HIGH.